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Agricultural Memorandum No 609

Variation of Potential Transpiration with height - L P Smith

Data from three stations in the northwest, Carlisle (92 ft) Eskdalemuir (778 ft) and Great Dun Fell (2780 ft) were used for the years 1966-1970.

The Eskdalemuir winds, especially in 1966 and 1967 before the move of the anemometer site, were clearly too low to be fully representative, and the mean monthly wind speed was interpolated between the other two station records. Otherwise all data was taken from the M.W.R.

Results — Millimetres/day

Carlisle	1966	1967	1968	1969	1970	5-year Mean (inches/month)
January	0.22	0.05	0.22	0.11	0.07	0.16
February	0.62	0.56	0.38	0.41	0.65	0.58
March	1.33	1.45	1.34	1.10	1.03	1.52
April	1.84	1.65	2.08	2.05	1.54	2.16
May	2.89	2.06	2.19	2.22	3.13	3.04
June	2.69	3.27	3.40	3.49	3.73	3.90
July	3.04	2.32	2.46	3.02	2.54	3.27
August	1.97	2.12	2.35	2.43	2.50	2.77
September	1.52	1.48	1.42	1.37	1.31	1.57
October	0.48	1.01	0.69	0.81	0.72	0.90
November	0.23	0.05	0.39	0.08	0.26	0.24
December	0.04	-0.03	0.03	0.02	-0.05	0.00
Eskdalemuir						
January	0.13	0.00	0.18	-0.07	-0.06	0.04
February	0.30	0.36	0.19	0.42	0.37	0.36
March	1.25	1.26	1.20	1.07	1.15	1.44
April	1.55	1.75	1.75	1.82	1.61	2.00
May	2.64	1.86	2.06	1.73	2.43	2.62
June	2.44	3.02	2.92	3.02	3.32	3.48
July	2.92	2.14	2.15	2.59	2.30	3.04
August	1.57	1.88	2.08	2.11	2.32	2.44
September	1.33	1.20	1.19	1.16	1.07	1.40
October	0.49	0.82	0.54	0.63	0.72	0.80
November	0.24	0.15	0.31	0.08	0.18	0.22
December	-0.02	0.08	0.02	-0.06	-0.04	0.00

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Great Dun Fell	1966	1967	1968	1969	1970	5-year mean (inches/month)
January	-0.05	-0.22	-0.13	-0.17	-0.33	-0.22
February	-0.11	0.00	0.12	0.20	0.02	0.05
March	0.40	0.22	0.28	0.37	0.24	0.37
April	0.59	0.71	1.19	1.11	0.69	1.01
May	2.24	1.06	1.37	1.07	1.94	1.88
June	1.75	2.11	2.58	2.75	2.95	2.86
July	2.04	1.43	1.59	2.03	1.16	2.02
August	1.26	1.37	1.48	1.68	1.89	1.87
September	0.90	0.74	0.77	0.70	0.72	0.90
October	0.17	0.08	0.10	0.40	0.27	0.25
November	-0.18	0.38	-0.16	-0.29	-0.18	0.08
December	-0.32	-0.28	-0.30	-0.26	-0.47	-0.40

Comparison of the 5 year means leads to the following summary.

Month	Mean P.T. (in/month) Carlisle	Eskdalemuir	Great Dun Fell	Correlation with height	Decrease with height in/100 ft
January	0.16	0.04	-0.22	-0.9978	0.014
February	0.58	0.36	0.05	-0.9842	0.018
March	1.52	1.44	0.37	-0.9828	0.045
April	2.16	2.00	1.01	-0.9929	0.044
May	3.04	2.62	1.88	-0.9931	0.042
June	3.90	3.48	2.86	-0.9864	0.037
July	3.27	3.04	2.02	-0.9972	0.047
August	2.77	2.44	1.87	-0.9925	0.032
September	1.57	1.40	0.90	-0.9999	0.025
October	0.90	0.80	0.25	-0.9745	0.025
November	0.24	0.22	0.08	-0.9911	0.006
December	0.00	0.00	-0.40	-0.9694	0.016
April-Sept (summer)	16.71	14.98	10.54	-0.9996	0.228
Oct - March (winter)	3.40	2.86	0.13	-0.9956	0.125
Year	20.11	17.84	10.67	-0.9999	0.353

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There is a clear consistent linearity which is not obtained if calculations are carried out adjusting each element separately for change with height. The reason must be that variations with height are inter-related between the four elements, so that independent adjustment is unacceptable as a correction method.

Tech. Bull No 16 gave the following suggested changes of P.T. with height

Summer	0.2in/100 ft	England	0.25in/100 ft	Scotland
Winter	0.15in/100 ft	England	0.1 in/100 ft	Scotland

The above values for the border country of 0.228 and 0.125 show remarkable agreement with these earlier estimates.

Any comments or suggestions on this paper should be referred to the author.

Meteorological Office
Bracknell
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